

## 1 CLAIMS

2 1. A molten metal reactor including:

3 (a) a treatment chamber having a treatment chamber inlet;

4 (b) a molten reactant metal flow inducing arrangement for inducing a flow of molten  
5 reactant metal into the treatment chamber through the treatment chamber inlet;6 (c) a feed chamber having a feed chamber outlet located adjacent to the treatment  
7 chamber inlet;8 (d) an output chamber connected to an outlet of the treatment chamber to receive  
9 molten reactant metal and reaction products from the treatment chamber; and10 (e) a supply chamber connected to the output chamber and to the treatment chamber.  
1112 2. The molten metal reactor of Claim 1 wherein the feed chamber outlet and the treatment  
13 chamber inlet comprise a common opening.  
1415 3. The molten metal reactor of Claim 2 further including a vortex inducing arrangement for  
16 inducing a swirling flow in the feed chamber outlet.  
1718 4. The molten metal reactor of Claim 2 wherein the feed chamber comprises a bowl shaped  
19 chamber and the feed chamber outlet is located in substantially the center of the bowl  
20 shape at a bottom of the feed chamber.

- 1     5.     The molten metal reactor of Claim 2 further including an impeller mounted in the feed  
2           chamber and adapted to be rotated about a substantially vertical axis.  
3
- 4     6.     The molten metal reactor of Claim 2 including an off-center molten reactant metal inlet to  
5           the feed chamber through which molten reactant metal is introduced into the feed  
6           chamber to induce a swirling flow in the feed chamber.  
7
- 8     7.     The molten metal reactor of Claim 1 wherein at least a portion of the treatment chamber  
9           is in a heat transfer relationship with the supply chamber.  
10
- 11    8.     The molten metal reactor of Claim 1 further including a gravity trap within the treatment  
12           chamber.  
13
- 14    9.     A feed structure for introducing a feed material into a treatment chamber of a molten  
15           metal reactor, the feed arrangement including:  
16           (a)     a feed chamber having a feed chamber outlet located adjacent to an inlet to the  
17           treatment chamber;  
18           (b)     a feed material inlet to the feed chamber, the feed material inlet being  
19           substantially aligned with the feed chamber outlet; and  
20           (c)     a molten reactant metal flow inducing arrangement for inducing a flow of molten  
21           reactant metal into the treatment chamber through the treatment chamber inlet and

1 through the length of the treatment chamber to a treatment chamber outlet, the  
2 flow of molten reactant metal being at a rate sufficient to carry feed material and  
3 reaction products into the treatment chamber.  
4

5 10. The feed structure of Claim 9 wherein the feed chamber outlet and the treatment chamber  
6 inlet comprise a common opening.  
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8 11. The feed structure of Claim 10 wherein the feed material inlet is located in a central  
9 portion of the feed chamber.  
10

11 12. The feed structure of Claim 11 further including a containment conduit extending from  
12 the feed material inlet to a level below the level of molten reactant metal in the feed  
13 chamber in an area below the feed material inlet.  
14

15 13. The feed structure of Claim 10 further including vortex inducing arrangement for  
16 inducing a swirling flow in the feed chamber, the flow having an axis substantially  
17 aligned with an axis of the feed chamber outlet.  
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19 14. The feed structure of Claim 10 wherein the feed chamber comprises a bowl shaped  
20 chamber and the feed chamber outlet is located in substantially the center of the bowl  
21 shape at a bottom of the feed chamber.

- 1      15.    The feed structure of Claim 10 further including an impeller mounted in the feed chamber  
2                    and adapted to be rotated about a substantially vertical axis.  
3
- 4      16.    The feed structure of Claim 10 including an off-center molten reactant metal inlet to the  
5                    feed chamber through which molten reactant metal is introduced into the feed chamber to  
6                    induce a swirling flow in the feed chamber.  
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